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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/649,704	08/28/2003	Yoshiaki Fukuzumi	241998US2S	6772

22850 7590 01/21/2005

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EXAMINER

HO, TU TU V

ART UNIT PAPER NUMBER

2818

DATE MAILED: 01/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/649,704	FUKUZUMI, YOSHIAKI	
	<b>Examiner</b>	<b>Art Unit</b>	
	Tu-Tu Ho	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 30 December 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-52 is/are pending in the application.
- 4a) Of the above claim(s) 3,4,12,13,20,21,25 and 27-52 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,5-11,14-19,22-24 and 26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>10/08/2004</u> .  | 6) <input type="checkbox"/> Other: _____                                    |

### DETAILED ACTION

1. Applicant's Amendment filed 12/30/2004 has been reviewed and placed of record in the file.

#### *Election/ Restriction*

2. Claims 32-52 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, and claims 3-4, 12-13, 20-21, 25, and 27-31 to nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 09/20/2004.

#### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Applicant's arguments with respect to **claims 1, 2, 5-11, 14-19, 22-24, and 26**, filed 12/30/2004, have been considered but they are moot in view of new ground(s) of rejection.

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4. **claims 1, 2, 5-11, 14-19, 22-24, and 26** are rejected under 35 U.S.C. §103(a) as being unpatentable over Costrini et al. U.S. Patent Application Publication 2004/0063223 (hereinafter referred to as the '223 publication).

The '223 publication discloses in Figures 1-8 and respective portions of the specification a semiconductor memory device substantially as claimed.

Referring to **independent claim 1**, the '223 publication discloses a semiconductor memory device comprising:

a memory cell comprising a first ferromagnetic film (110 in Fig. 2B and 5; which film 110 becomes film 112 in Fig. 7), a tunnel barrier film (115) formed on the first ferromagnetic film, and a second ferromagnetic film (120, which becomes 122 in Fig. 7) formed on the tunnel barrier film;

a cap layer (92, copper electrode) formed on the second ferromagnetic film;

a side wall insulating film (82) formed so as to surround at least sides of the second ferromagnetic film; and

an interlayer insulating film (86, Fig. 6) formed so as to cover the memory cell and the side wall insulating film.

However, the side wall insulating film (82) of the reference has an upper surface that appears to be planar with that of the cap layer rather than lower than that of the cap layer as claimed. In other words, there is a difference between the shapes of the side wall insulating film of the claim and the reference with respect to the vertical direction and in relation to the cap layer. Nevertheless, the difference in the shapes is taken to be obvious because at least one of the following two reasons: **(1)** Although the reference does not teach the exact shape of the side

wall insulating film as that claimed by Applicant, the shape differences are considered obvious and are not patentable unless unobvious or unexpected results are obtained from these changes. Additionally, the Applicant has presented no discussion in the specification which convinces the examiner that the particular shape of the side wall insulating film - with respect to the vertical direction and in relation to the cap layer - is anything more than one of numerous shapes a person of ordinary skill in the art would find obvious for the purpose of providing side wall insulating films. It appears that the change produces no functional differences and therefore would have been obvious; and **(2)** in order to obtain the side wall insulating film as claimed, one of ordinary skill in the art at the time the invention was made would have to form a blanket insulating film, such as layer 40 as disclosed by Applicant or such as layer 72 by the '223 publication, then perform an etch (the '223 publication, paragraph [0020]), the timing of which (the duration of the etching step) dictates the shape of the side wall insulating film as is known in the *side wall insulating film forming art* for semiconductor devices (see, for example, U.S. Patent 6,229,170 to Sakao, column 7, first full paragraph and Figs. 8B and 8C); and **controlling the timing** of the etch for forming the side wall insulating film **is within the skill of one in the art** at the time the invention was made and therefore would have been obvious.

Referring to **independent claim 10** and using the same reference characters, citations, and interpretations as detailed above for claim 1 where applicable, the '223 publication discloses a semiconductor memory device comprising:

a memory cell comprising a first ferromagnetic film, a tunnel barrier film formed on the first ferromagnetic film, and a second ferromagnetic film formed on the tunnel barrier film;

a cap layer (92, copper electrode) formed on the second ferromagnetic film; and

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a side wall insulating film (82, from layer 72 of Al<sub>2</sub>O<sub>3</sub>, paragraph [0020]) formed so as to surround at least sides of the second ferromagnetic film and containing a metal element (Al).

However, similarly to claim 1, there is a difference between the shapes of the side wall insulating film of the claim and the reference with respect to the vertical direction and in relation to the cap layer; but nevertheless, the difference would have been obvious to one of ordinary skill in the art at the time the invention was made, as noted above for claim 1.

Referring to **independent claim 19** and using the same reference characters and citations as detailed above for claim 1, the '223 publication discloses a semiconductor memory device comprising:

a memory cell comprising a first ferromagnetic film, a tunnel barrier film formed on the first ferromagnetic film, and a second ferromagnetic film formed on the tunnel barrier film;

a cap layer (92, copper electrode) formed on the second ferromagnetic film; and

a side wall insulating film (82) formed on the tunnel barrier film (115) so as to surround a periphery of the second ferromagnetic film (120) (paragraph [0017] or claim 2 of the '223 publication, for the etching step ("The ferromagnetic freelay 120 is etched, stopping on the tunnel layer 115...") and paragraph [0020], for forming side wall spacer 82).

However, similarly to claim 1, there is a difference between the shapes of the side wall insulating film of the claim and the reference with respect to the vertical direction and in relation to the cap layer; but nevertheless, the difference would have been obvious to one of ordinary skill in the art at the time the invention was made, as noted above for claim 1.

Referring to **claims 2 and 11** and using the same reference characters and citations as detailed above for claim 19, the '223 publication further discloses that the side wall insulating film (82) contacts with the tunnel barrier film (115).

Referring to **claims 5, 14, and 22** and using the same reference characters and citations as detailed above for claim 10, the '223 publication further discloses that the side wall insulating film is formed of aluminum oxide.

Referring to **claims 6, 15, and 23**, the '223 publication further discloses that the side wall insulating film (82, from layer 72 of Al<sub>2</sub>O<sub>3</sub>, paragraph [0020]) and the tunnel barrier film (115, alumina, paragraph [0011]) contain a common metal element (aluminum of Al<sub>2</sub>O<sub>3</sub> and aluminum of alumina).

Referring to **claims 7, 16, and 24** and using the same reference characters and citations as detailed above for claim 6, the '223 publication further discloses that the side wall insulating film and the tunnel barrier film are both formed of aluminum oxide.

Referring to **claims 8 and 17**, the '223 publication further discloses that the side wall insulating film (82) contacts with at least a part of side wall of the tunnel barrier film (115) along a circumferential direction (Fig. 5).

Referring to **claims 9, 18, and 26** and using the same reference characters and citations as detailed above for claim 6, the '223 publication further discloses that the tunnel barrier film is formed of aluminum oxide.

***Conclusion***

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office Action. See MPEP § 706.07(a).

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (571) 272-1778. The examiner can normally be reached on 6:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID NELMS can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications



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may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tu-Tu Ho  
January 16, 2005



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